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Eng-7160-103

Director of Logistics

Director of Communications

To  
Engineering Staff

Request for Contract Amendment, RD-107, Task Order 11

00 9089  
12 FEB 1960

1. Under the terms of RD-107, Task Order 11, [ ] is developing a water activated battery for this Office. Due to difficulties in obtaining materials for this development early in the program, this task has extended beyond the original schedule and will now be completed approximately 5 months after acceptance of this amendment.

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2. A request for additional funds to cover this extension of time has been received from the contractor in a letter dated 19 January 1960, a copy of which is attached. In this letter two proposals for completing this task are given. This office has carefully examined these proposals and requests that proposal "A" be accepted less payment of the \$660.00 fee. The reason for this increase in funds and time extension stems from the fact that the contractor was unable to procure silver clad magnesium. It was necessary, therefore, for the [ ] to provide a means of producing a suitable material. It is our opinion that this does not constitute a change in scope and the fee of \$660.00 is not justified.

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3. Therefore, it is requested that Task Order 11 under RD-107 be amended to authorize these additional costs requested by the contractor, and extend the termination date 5 months from acceptance of this amendment. Attached is Requisition No. MEB 60-375 indicating that the allotment to be charged is 9/7900-50-095. Funds in the amount of \$8,251.00 have been encumbered for this purpose. This task order is Agency sterile, but the equipment resulting therefrom is UNCLASSIFIED. The project engineer for this program is [ ] Extension [ ]

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## Attachments:

- (1) Contractor's letter dated 19 January 1960
- (2) Requisition No. MEB 60-375

## Distribution:

Original and 1 - Addressee w/attachments  
 R+D Subject File w/o attachments  
 OC-A w/o attachments  
 [ ] w/o attachments  
 OC-T w/o attachments  
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 OC-E Chrono w/o attachments

## Coordination:

R+D

OC-E

OC-T

OC-A

OC-P

DD/CO

OC-E/R+D/EP:CWS:maf (8 Feb. 60)

bcc: [redacted]

January 19, 1960

Subject: Program Extension

Reference: [redacted]  
Water-Activated Battery  
[redacted]

Dear Sir:

Confirming our telephone conversation between your [redacted] of this office on January 6, 1960, [redacted] in the interest of furthering the effort and results thus far obtained, is hereby submitting two proposals for an extension of the present requisition. It is to be noted in the attached Exhibit "C" that the achievements in association with this effort have actually been beyond those anticipated at the time that the work was undertaken. These accomplishments are described in Exhibit "C", Page 2, Items 2, 3, 4, and 7. Some of the problems which have been encountered in the performance of work are also described in Exhibit "C", Page 3, Paragraph III.

The following proposals are submitted for your consideration and selection:

PROPOSAL "A"

An extension of the contract for a period of five months from the date of the contract amendment. [redacted] will deliver 6 Battery Cases and 30 refills. Attached as Exhibit "A" is a cost breakdown for Proposal "A" for a total selling price estimated on a CPFF basis of \$8,911. The detail of the proposed work is described in Exhibit "C".

PROPOSAL "B"

An extension of the contract for a period of three months from the date of the contract modification. [redacted] will deliver 2 Battery Cases and 10 refills. Attached as Exhibit "B" is a cost breakdown for Proposal "B" for a total selling price

Contracting Officer

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January 19, 1960

estimated on a CPFF basis of \$6,151. Proposal "B" is also described in Exhibit "C" and is essentially identical to Proposal "A" with the exception of the number of end items and laboratory effort.

In order to properly plan our manpower commitments, it is necessary to limit these proposals to sixty days. A written extension may be affected thereafter if agreeable to both parties.

If there are any questions or if further information is needed, please do not hesitate to contact the undersigned.

Very truly yours,

[Redacted Signature]

Contract Administration

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Enclosures -

CC:

[Redacted CC]

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EXHIBIT "C"

Proposed Work  
for  
The Extension of  
Water Activated Battery Development



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I. Objectives of Present Contract

Phase 1:

To demonstrate the feasibility of a large model, chemically rechargeable, magnesium-silver chloride battery, activated by a 3 per cent salt solution at room temperature and delivering an average current of 3 A at 12 V for at least 60 minutes. The voltage regulation at a maximum load current of 5.3 A shall equal or surpass the stability obtained previously.

Phase 2:

To demonstrate reasonably satisfactory performance of this battery at environmental temperatures of  $-40^{\circ}\text{C}$  and  $40^{\circ}\text{C}$ , using a variety of electrolytes such as 3 per cent salt solution, tap water and others. It is recognized, however, that such performance cannot be expected to match that at room temperature.

Phase 3:

To fabricate and deliver six battery cases and thirty complete sets of chemical recharges for field testing purposes, including instructions on the proper handling, activation, deactivation, disposal and temperature control.

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## II. Achievements During 1959

Our achievements to date can be summarized as follows:

1. A study was made of the basic reactions and discharge mechanisms of this battery with special emphasis on the processes contributing to the internal generation of heat.

2. A new technique for producing a suitable bond between silver and magnesium foils was successfully developed.

3. This technique was extended to include other battery elements, leading to a substantial reduction in the number of battery components and a corresponding simplification in operating procedure.

4. It was found that other components (spacers) could be eliminated with only a small sacrifice in capacity, leading to an additional simplification in operating procedure.

5. The battery was designed, constructed and successfully tested at environmental temperatures of  $+25^{\circ}\text{C}$ .

6. Exploratory tests indicate, that activation and operation of the battery at  $-40^{\circ}\text{C}$ , with only a small sacrifice in capacity, is possible if suitable liquid salt solutions are added to the cold battery case. The minimum permissible temperature of the liquid electrolyte varies between  $-40^{\circ}\text{C}$  and  $+20^{\circ}\text{C}$  depending on the salt solution used.

7. A new type of battery cooling, based on the evaporation of a small amount of water applied externally to specially designed battery panels, has been developed, which promises the successful operation of the battery at  $+40^{\circ}\text{C}$  without the need for additional accessories and/or increases in size and weight.

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Achievements 1-5 are fully described in our bimonthly reports Nos. 1 and 2 while achievements 6 and 7 are the subject of report No. 3 which is in preparation. In summary it can be said that the entire phase 1 and a substantial part of phase 2 have been completed.

### III. Reasons for Underestimating the Scope of this Program

The most important modification of this program became apparent at its very beginning. At that time it was found, contrary to expectation, that the procurement of silver clad magnesium, although available in small sample form, was not possible in moderately large quantities. Consequently, as described in report No. 1, a new task for the development of a new technique for producing a suitable bond between silver and magnesium foils had to be added to the program. The performance of this task, achievement No. 2, required two months of intensive work.

The desirability of another modification became apparent only after it was found that the assembly and disassembly of a chemical charge required considerable manual dexterity and the use of some simple tools. This further development lead to a drastic reduction in battery compounds, described in report No. 2 (achievements 3 and 4).

The time required to carry out these tasks (achievements 2, 3 and 4) made completion of phase 3 impossible on the present contract.

### IV. Effort Required to Complete the Modified Program

Since most technical problems (Phase 1) of this program were solved during 1959, there is no doubt that the successful completion of the program can be virtually assured. For completion of phase 2 the



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exploratory testing of a few additional, potentially interesting electrolytes both at low and high temperatures will be required. This should be supplemented by some representative full scale battery tests at both temperature extremes.

The commercial non-availability of silver clad magnesium not only increased the magnitudes of the development effort of Phase 1, but it also greatly increased the effort required for the fabrication program of Phase 3, which is to be initiated after the completion of Phase 2. Consequently, it is estimated that the completion of the program will require an intensive effort on fabrication and assembly during a four to six month period following the resumption of work. During this period about three months of technician's time, one month of a man in the shop and two weeks of supervision  will be required.

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